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THE RAINBAND VINDICATED.

It is now some four years since that in the pages of the *Meteorological Magazine* I essayed to give a popular character to a comparatively unknown branch of science in my "Plea for the Rainband."

Has this plea been successful, and has the rainband vindicated its position as a weather prognostic? I venture to think that both these questions may be answered in the affirmative. Soon after the publication of the article, I was requested by a well-known optician to permit a reprint of it as a companion to the spectroscope, and before long many copies of it were distributed amongst meteorologists and others. This brought the matter before the public, and not long after rainband spectroscopes, pamphlets, and discussions showed that a keen interest was felt in the subject.

Of course, as in the case of all other new objects, the first rush for information and possession by and by passed, and the interest in it to a certain extent subsided. I have recently found, however, from enquiries and correspondence addressed to me, that this, though diminished, has by no means died out. I propose, therefore, to justify what the "Plea" advanced by shortly stating the subsequent progress of rainband spectroscopy to the present time.

The impetus given to the enquiry may be recognized in three ways: by (1) its recent literature; (2) the increased use of the spectroscope as a meteorological adjunct; and (3) recorded observations and their results.

THE RECENT LITERATURE.

In taking up the first subject, the recent literature of the rainband, I propose to deviate somewhat for the purpose of introducing an interesting early notice of it which escaped my attention when writing my "Plea," and which it would be unjust now to omit. It dates back as far as 1869, and will be found in the *Meteorological Magazine* for July and October of that year, vol. iv. Nos. xlii. and xlv., "The indications of the sky." The first part of this article describes and figures Saussure's cyanometer and its mode of use, and then after quoting Kaemtz on the blue colour of the air comes the

following passage :—"In spite of ourselves the above extract has led from the original subject of this article, the cyanometer, to what must, we presume, be held to be its legitimate successor, the spectro-scope." The second part of the article treats of the spectroscope and its advantages to meteorologists, and by an extract from the British Association Report for 1868, "Observations on the atmospheric lines of the solar spectrum in high latitudes, by George Gladstone, F.C.S., F.R.G.S.," it points out the distinction between "atmospheric" and "solar" lines, and shows how these former are always most prominent with a low sun, while scarcely visible with a high one. Also that the red end of the spectrum varies under similar circumstances in length and brilliancy. Prof. Roscoe's "Spectrum Analysis" is quoted, a figure of a pocket spectroscope (reproduced here) is given,



Fig. 1.

and the article ends thus :—"No one can tell what secrets lie hid in these atmospheric lines, but to us it seems that by their careful and systematic observation the 'Message from the Stars' which has taught us so much may be rivalled in practical importance by a 'Message from the Sky.'"

This prediction may not have caught the full import and meaning of the atmospheric bands and lines, but at least it forecasts the value they subsequently attained in meteorology.

Passing from this, we will refer to a correspondence in the *Times*, which took place in the latter part of 1882, and in which both sides of the question were jealously advocated. Prof. C. Piazzi Smyth here pens a series of letters in favour of the rainband. In one of these he states he saw a spectroscopic rainband, "the blackest and most intense of the season," and "destructive floods followed." As the rainband cleared away, "magnificent harvest days followed." Mr. Ralph Abercrombie sees no value in the rainband, and pins his faith upon "isobaric lines," and the forecasts of the Meteorological Office derived therefrom. The Duke of Argyle in a yachting cruise could not see that the rainband had any predictive value, and thinks Prof. Smyth's case was a "good shot." Per contra, Mr. Cory, F.M.S., contends for the value of the rainband, and gives reports of a series of observations proving his case. Agricultor (in the *English Mechanic*) "has been much struck by the accuracy with which the rainband appearance predicts coming rain."

Mr. Abercrombie's isobars are most amusingly discounted by Sir Edmund Beckett in a letter containing a long list of official weather

prophecies and their want of fulfilment, and recommending "a return to Zadkiel." In June, 1883, my weekly weather report to the *Surrey Advertiser* contained the following :—"Of these rainfalls, the only indication was the rainband, the barometer throughout standing fairly high (between 29·84 in. and 29·99 in.)" Thus the public prints not only took an interest in, but on the whole supported the rainband theory.

As observers and observations increased, more solid literature was developed, including :—*Nature*, vol. xxvi., pp. 552-4, "Spectroscopic Weather Discussions," by Prof. C. Piazzzi Smyth, in which the whole subject is reviewed in a condensed form with instructions to observers, and illustrated by two diagrams of the D part of the solar spectrum under considerable dispersion, the one taken in August, 1882, under moist air conditions, and the other on September 4th, 1882, after a whole week of very dry weather. In this article it is shown that, apart from the spectroscope, the wet bulb difference only slightly indicated the sweeping away which took place in September of the water vapour details shown in the August spectrum. On another occasion Prof. Smyth defended the rainband, *Nature*, vol. xxix., p. 525, "Rainband spectroscopy attacked again." In an essay read before the Phil. Society of Washington, and printed in the *American Journal of Science*, the writer of it referred to the "unsatisfactory evidence" of the rainband, because "if the spectroscope is first turned to the sky in any direction, and afterwards to a white wall fifty feet distant, it will be found impossible to distinguish between the appearance of the rainband, as shown by the whole atmosphere, and by the layer fifty feet thick."

The Professor disposes of the objection by promptly pointing out that "the white wall reflects the light and sky spectrum solar lines, and telluric lines and all !"

Of the books and articles published, the following were kindly sent me by the authors :—

"The Science Monthly," illustrated, for December, 1883. "The Hygro-Spectroscope (or Rainband Spectroscope)," by F. W. Cory, F.R.Met.S., with illustrations of a spectroscope and a rainband spectrum.

"How to foretell the weather with the pocket spectroscope," F. W. Cory (Chatto and Windus, 1884) ; 86 pages, and 10 illustrations of instruments, charts, &c. The Appendix contains the September, 1882, *Times* correspondence in full.

"Observations of the Rainband from June, 1882, to January, 1883," by Hugh Robert Mill, B.Sc., communicated by Prof. Tait to the Proceedings of the Royal Society of Edinburgh, with a chart.

"The Rainband : How to observe it, and what to expect from it," by Hugh Robert Mill. Hilger, 1883. With four figures and a chart.

In the above papers and volumes are contained much useful instruction in the use of the spectroscope, and valuable tables and statistics of rainband results, some of which are referred to later on.

THE INCREASED USE OF THE SPECTROSCOPE.

The increased use of the spectroscope quickly followed the publication of the "Plea."

Mr. Browning, at my suggestion, prepared a "standard" instrument, in which was represented a spectrum, as nearly like as possible that figured in the frontispiece to the "Plea."

In this instrument was introduced what I considered for the special purpose an improvement, viz., a fixed slit. This showed the lines about as wide as in the plate, and in a series of observations secured their correspondence.

THE STANDARD SPECTROSCOPE.



Fig. 2.

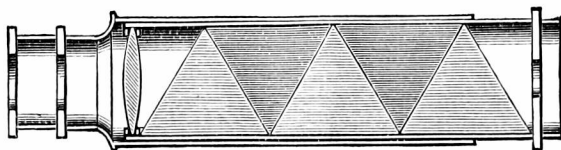


Fig. 3.

Of course many other opticians soon began to supply "rainband spectroscopes," but these varied considerably in power and dispersion, and thus did not realize what was my idea of uniformity of observation. I do not wish to specially recommend any maker, but I think it really would be of great advantage if the Royal Meteorological Society or some other competent tribunal would define the width of slit, dispersion of prisms, and the magnifying power to be used. Every observer who has tried several spectroscopes knows how the appearance of the rainband varies according to these incidents.

(To be continued).

Robert Beckley.

In Robert Beckley has passed away one of the best, if not actually the best, mechanic ever occupied with the construction of the heavier class of meteorological instruments.

As mechanical assistant at Kew Observatory, he was at once in the position most accordant with his own wishes, and most useful to science.

It would be tedious to enumerate all the improvements which he suggested—those who knew him best, know best his rare skill, but to meteorologists of all countries the excellence of the Beckley pattern of the Robinson anemometer will be a sufficient indicator of his skill.

THE LUMINOUS CIRRUS CLOUD OF JUNE AND JULY.

To the Editor of the Meteorological Magazine.

SIR,—Seeing the mention on p. 96, of the singular and very brilliant cirrus clouds visible on several occasions during June at Dublin, I write to say that I witnessed a similar phenomenon at Kissingen (Bavaria), on June 8th and 10th, and July 7th. A letter in *Nature*, of July 16th, describes their appearance, as seen at Southampton on the 6th of that month; and they were observed on the same evening from Blackheath.

It was evident to me (at Kissingen) that the sun was shining on them, and they were so thin as to become quite invisible when the sun ceased to illuminate them; but I did not see these clouds at all before sunset, and cannot say whether they existed then.

The colouring of the upper part was pale steel blue, gradually changing through a dull green to yellow and orange below, varying a little on the three evenings, and at different times. The phenomenon was extremely striking at so late an hour, the mode in which the clouds reflected the light reminding me of the unusual iridescent clouds so widely remarked on a few days last December; but both the colours and the kind of cloud were different.

As the dates of the displays at Dublin are not given, I am unable to decide whether I was viewing the same sheet of cloud at Kissingen; but the one day difference of date of my observation in July, from that in England, would probably be no more than the time required for it to traverse the intervening distance.—Yours truly,

T. W. BACKHOUSE.

Sunderland, 10th Sept., 1885.

SEPTEMBER FROSTS.

To the Editor of the Meteorological Magazine.

SIR,—The following minimum and mean temperatures recorded here on a Glaisher stand are very remarkable:—

				Min.		Mean.
26th September, 1885	...	...	...	31°·7	...	42°·8
27th	„	„	...	28·8	...	38·9

My only September readings during the last 17 years at all comparable with these are:—

				Min.		Mean.
22nd September, 1872	...	..	...	32°·0	...	44°·5
23rd	„	„	...	30·5	...	46·0
15th	„	1882	...	30·6	...	47·3

but the mean (38°·9) of the 27th inst. is not only considerably lower than these, but 1°·8 below that (40°·7) of 28th September, 1824, given in Mr. Glaisher's tables as the lowest September temperature in the past 60 years.—Yours faithfully,

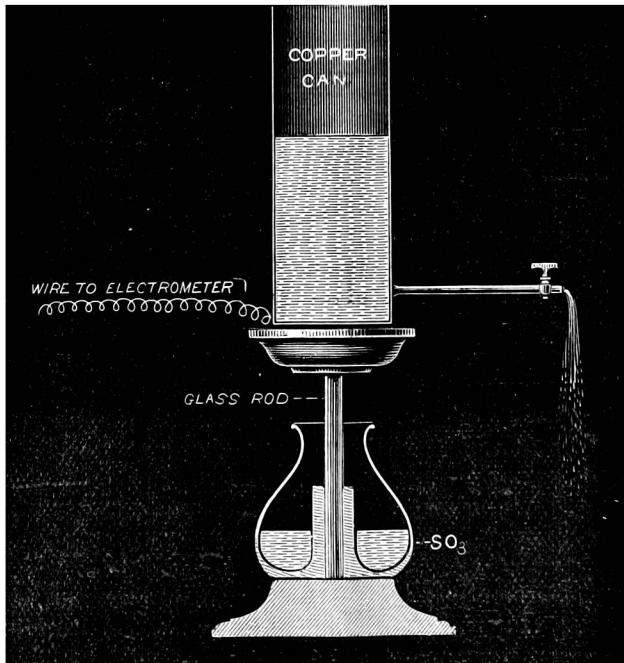
PERCY BICKNELL.

Foxgrove, Beckenham, Sept. 30th, 1885.

ATMOSPHERIC ELECTRICITY.

To the Editor of the Meteorological Magazine.

SIR,—In continuation of my former letter, and before stating the “results,” I wish to describe another way of collecting electricity from the air which has been adopted. This consists of a copper can about six inches across and eighteen inches high, and containing some two gallons of water. This is furnished with a long tube or spout, ending in a brass tap with a small aperture. It is placed on a Mascart insulating stand, and connected with the electrometers by a copper wire. As soon as the tap is turned on, and the water issues from it, the can at once becomes charged with electricity of the same sign as the surrounding air. The effect is greatest when the stream is broken into drops in its fall. This apparatus was found to give, at 15 ft. above ground, deflections of 5° and 10° with the quadrant electrometer, when both sets of points gave no signs of charge whatever. At another time, and when only 4 ft. from the ground, it afforded results, the air being so damp that it was difficult to excite the electrophorus, with which the quadrants were at that time charged. It is thus very sensitive, and at the same time portable.



The general observations have been hardly numerous enough to warrant the assertion of fixed laws, but they seem to establish the following facts pretty satisfactorily :—

- (1) The wind is evidently a strong excitant of electricity. One bright morning, as gusts of wind swept across an outside insulated brass plate, each gust was accurately repeated by a beat of the gold leaf suspended in the Bohnenberger electrometer.
- (2) As a rule, though not without exception, the mornings marked "blue sky" showed feeble positive electricity. The exceptions seemed to have occurred lately, when much morning mist has prevailed, and the hygrometer has stood high.
- (3) Clouded and damp mornings, though also with exceptions, have yielded the negative sign.
- (4) Storms (with one exception) have always given a strong negative sign as they approached the "points." As snow or rain fell, this changed to positive, and in several instances there was a change back to negative before the indications ceased. The exception was a storm on the 24th of July, 1884, at 8.30 p.m., after a fine day, when the sign was first positive, then negative, and ultimately positive again. On rain or snow falling, the electrical conditions in these cases, became very marked, sparks flying from the ends of the conducting wires, the pith balls diverging widely, the mirror deflections amounting to 80° , and the gold leaf being torn away or broken up.
- (5). Probably strata opposite in sign may co-exist at different elevations above the earth's surface. Thus on December 6th, 1883, at 10 a.m., a snow-storm coming on, the tower points were strongly negative, but the points near the observatory were charged positively, and this persisted for a quarter of an hour.
- (6). The observations do not show with any certainty whether the quantity of electricity varies with the height of the points above the observatory. Five instances are, however, marked "from the tower only," and two "from the lower points only." The tower current has at times been the stronger. Generally it is the weakest, but this I attribute to the resistance of 300 feet of wire, which complete its connection with the receiving apparatus.

From what I have described, it will be seen that periodic observations of atmospheric electricity are possible with simple and inexpensive apparatus. Where expense is not an object, it would be easy to convert these into self-recording forms (as at Greenwich), and thus obtain a continuous and more valuable series of observations.

J. RAND CAPRON.

Guildown Observatory, August 9th, 1885.

ON THE CLIMATE OF THE BRITISH EMPIRE DURING 1884.

The Annual Climatological Table which we have now published in exactly the same form for some years, scarcely needs any introduction. The number of stations shows a slight increase over the number available for 1883, but Barbados, which is usually prominent, owing to its peculiarities of climate, is absent, the return for one month having failed to reach us. Malta appears for the first time.

The unenviable extremes noted in the following summary are distributed over somewhat different stations than those appearing last year, though Adelaide heads the list for extreme heat. Winnipeg has resumed its old place for the other extreme of cold, and Colombo takes the place of Barbados for uniformity of temperature while still appearing with the greatest total rainfall. The two extremes for which Malta appears — least amount of cloud and smallest rainfall—are certainly not unenviable as far as persona comfort is concerned.

S U M M A R Y .

Highest temperature in shade, $110^{\circ}\cdot 2$, at Adelaide, on January 13th.
 Lowest temperature in shade, $-44^{\circ}\cdot 5$, at Winnipeg, on January 3rd.
 Greatest range in year, $133^{\circ}\cdot 0$, at Winnipeg.
 Least range in year, $24^{\circ}\cdot 6$, at Colombo, Ceylon.
 Greatest mean daily range, $22^{\circ}\cdot 4$, at Winnipeg.
 Least mean daily range, $10^{\circ}\cdot 4$, at Colombo, Ceylon.
 Highest mean daily temperature, $80^{\circ}\cdot 3$, at Colombo, Ceylon.
 Lowest mean daily temperature, $29^{\circ}\cdot 7$, at Winnipeg.
 Driest station, Adelaide ; mean humidity, 57.
 Dampest station, Winnipeg ; mean humidity, 82.
 Highest temperature in sun, $169^{\circ}\cdot 3$, at Adelaide.
 Lowest temperature on grass, $-22^{\circ}\cdot 0$, at Toronto.
 Greatest Rainfall, 82·14 inches, at Colombo, Ceylon.
 Least rainfall, 17·97 inches, at Malta.
 Most cloudy station, Toronto ; average amount, 6·5.
 Least cloudy station, Malta ; average amount, 3·3.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1884.

STATION.	ABSOLUTE.				AVERAGE.						ABSOLUTE.		TOTAL RAIN.		AVER- AGE.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity	Max in sun.	Min. on grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.											
England, London.	92·0	August 11	25·3	November 25	59·3	43·6	51·5	44·0	78	125·4	21·4	20·34	150	6·2	
Malta	94·6	July 19	41·2	February 23	70·9	58·8	64·9	56·2	77	149·0	36·0	17·97	68	3·3	
Mauritius	86·0	Jan. 9, Dec. 19	54·1	August 22	79·4	68·2	73·8	64·3	75	138·5	46·2	45·80	174	5·4	
Calcutta	103·7	April 14	50·0	February 11	85·9	69·9	77·9	69·1	78	163·6	37·6	62·61	116	4·2	
Bombay	92·4	April 4	61·6	Jan. 29, Feb. 1	85·2	73·7	79·5	71·1	76	149·9	49·0	75·44	110	3·7	
Ceylon, Colombo.	93·4	February 19	68·8	Jan. 24, Feb. 4	85·5	75·1	80·3	71·7	75	150·0	59·0	82·14	159	5·7	
Melbourne	100·7	February 13	33·0	August 1	66·8	48·7	57·8	46·6	71	158·0	24·5	25·85	128	6·2	
Adelaide	110·2	January 13	35·2	July 23	71·4	53·0	62·2	...	57	169·3	26·5	18·74	138	5·0	
Wellington	79·0	February 23	32·0	August 7	59·9	47·9	53·9	...	...	145·0	29·0	65·11	167	...	
Auckland	77·5	January 9	37·0	June 1	63·4	51·8	57·6	48·4	72	149·0	27·0	38·07	203	6·1	
Jamaica, Kingston	92·7	September 18	62·3	February 7	86·3	70·7	78·5	70·5	79	..	...	26·24	...	4·8	
Toronto	89·6	August 19	—13·3	December 19	51·9	34·9	43·4	37·7	76	148·0	—22·0	28·55	182	6·5	
Fredericton	92·7	June 29	—34·5	January 29	50·2	28·7	39·4	34·0	78	...	...	53·97	188	6·0	
Winnipeg	88·5	June 22	—44·5	January 3	40·9	18·5	29·7	29·2	82	...	...	24·13	113	5·5	

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1885.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		0-10
England, London	57·8	12	27·6	21	49·9	38·7	39·4	83	79·2	20·8	2·86	18	6·6
Malta	73·5	22	42·2	15	62·8	51·1	48·8	80	126·0	37·4	·33	5	3·1
Cape of Good Hope.....	94·0	8	51·5	4	81·2	60·7	...	...	...	...	2·12	6	2·3
<i>Mauritius</i>	86·7	1	68·8	15	84·7	74·3	70·6	77	139·1	63·3	2·16	14	6·0
Calcutta.....	85·0	28	51·7	21	79·0	59·9	58·5	72	144·7	40·2	2·02	8	3·7
Bombay.....	83·8	19	60·6	11	80·3	65·3	60·5	65	138·6	48·4	·00	0	1·0
Ceylon, Colombo.....	95·8	22	70·4	5	88·0	72·8	69·1	68	148·5	63·8	·75	3	4·9
<i>Melbourne</i>	101·6	5	46·1	3	76·9	55·2	52·4	67	157·6	37·9	2·74	8	6·2
<i>Adelaide</i>	103·8	4	50·7	8	80·6	61·1	50·5	48	157·2	41·0	·91	7	4·8
<i>Wellington</i>	76·0	14	49·0	6	69·1	55·4	...	...	146·0	44·0	1·92	7	...
<i>Auckland</i>	79·0	14	54·0	5	74·2	57·9	53·5	64	149·0	43·0	·17	3	4·4
Jamaica, Kingston.....	86·9	21	65·8	20	84·0	68·7	69·8	84	...	53·3	·01	1	2·3
Barbados	80·0	6a	65·0	12	78·0	69·0	69·0	79	142·0	...	2·12	9	5·0
Toronto	36·6	10	—14·9	2	19·2	0·1	10·0	82	110·0	—19·0	1·82	13	...
New Brunswick, Frederickton	37·9	10	—23·2	12	23·6	—3·2	9·0	87	...	...	3·47	10	4·8
Manitoba, Winnipeg ...	36·7	27	—42·5	9	3·0	—19·4	—0·5	87	...	...	·44	8	4·3
British Columbia, Victoria	58·0	19	27·0	22	49·5	38·8	...	...	...	...	3·84	16	...

* And 7, 19

REMARKS, FEBRUARY, 1885.

MALTA.—Mean temp. 56°·0; mean hourly velocity of wind 11·3 miles; sea temp. fell to 58° on 15th, but rose again to 62° on 21st, remaining at that point to the close of the month; H on 10th. J. SCOLES.

Mauritius.—Rainfall 2·83 in. below and mean temp. 0°·4 above the average; mean hourly velocity of wind 2·5 miles below average; extremes 22·6 miles and 1·9 miles; prevailing direction E. to E. by N. T and L on six days, L alone on six. Very heavy sea on 24th and 25th from N. and N.W. C. MELDRUM, F.R.S.

Melbourne.—Rainfall ·79 in., and amount of cloud ·9 above average; mean temp. of air 1°·4, and of dew point 0°·8 below average; mean humidity slightly above, and pressure slightly below average. Prevailing winds S. and W., strong on four days. TSS on 12th and 18th; T on three days, L on two. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean min. temp. only 0°·8 below the average; but mean max. 2° lower than any previously recorded for February, and nearly 6° below the average of 28 years; the temp. reached 90° on only five days. The mean amount of cloud was in excess of any previous record, being about equal to the midwinter average. C. TODD.

Wellington.—First three days dull and showery, with strong N.W. winds; from 5th to 23rd, fine bright and warm, with heavy dews at night and moderate winds, except on the 9th, 10th and 11th, when it blew strongly from N.W.; 24th to 26th, dull and showery; 27th and 28th fine and bright; on the whole a pleasant seasonable month. Rainfall little more than half the average; mean temp. slightly below and pressure slightly above the average; slight earthquake on 19th. R. B. GORE.

Auckland.—Remarkably fine and dry throughout, with light variable winds; rainfall the lowest yet recorded for the month. T. F. CHEESEMAN.

JAMAICA.—The rainfall over the whole island was only one half the average, and the drought was severely felt over the greater part. MAXWELL HALL.

BARBADOS.—Mean temp. (73°) average; rainfall 41 per cent. below average. Prevailing wind N.E., mean hourly velocity 15 miles, being 30 per cent. above the average of 11 years; extremes 20 miles and 8 miles. R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1885.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
°		°		°		°	0-100	°	°	inches			
England, London	62·6	20	26·5	8	49·4	33·0	33·6	76	78·7	28·0	1·65	7	5·8
Malta	82·2	11	46·6	26	65·7	52·1	49·3	77	131·3	41·1	0·17	5	2·5
Cape of Good Hope.....	96·0	3	47·0	9	79·6	57·5	...	...	...	...	1·15	4	3·1
<i>Mauritius</i>	85·0	8	69·8	23	83·5	72·8	69·4	78	142·9	61·1	5·73	15	5·8
Calcutta	98·7	29	62·4	9	91·1	70·1	67·6	70	154·9	50·0	1·01	2	2·5
Bombay	90·9	30	65·0	3	84·4	72·2	69·2	74	144·3	53·6	·00	0	1·5
Ceylon, Colombo	91·2	30	72·6	13	88·4	77·2	76·2	81	147·2	59·8	5·71	9	2·6
Melbourne	95·2	18	42·5	21	72·7	52·3	49·4	66	142·1	30·6	2·39	12	5·8
Adelaide	93·6	17	45·8	20	75·8	56·1	47·5	51	154·2	34·4	0·33	7	4·4
Wellington	72·0	2, 6*	46·8	20	66·4	54·2	...	...	145·0	39·0	3·43	13	...
Auckland	77·5	2	49·0	18	70·4	56·5	52·9	68	140·0	40·0	2·36	15	5·0
Jamaica, Kingston	92·2	24	64·3	1	85·5	68·6	69·9	81	...	...	0·29	...	2·4
Barbados	81·0	15	68·0	var.	79·0	69·0	69·5	77	141·0	...	2·07	12	5·0
Toronto	43·3	31	30·8	9	27·1	9·2	14·5	79	116·0	-12·8	1·22	14	...
New Brunswick, Frederickton	48·8	28	-15·3	24	28·9	3·0	14·2	77	...	...	3·92	16	4·7
Manitoba, Winnipeg	40·6	30	-34·5	...	21·7	-5·8	8·3	84	...	...	1·12	7	5·5
British Columbia, Victoria	67·0	17	32·0	3	55·2	37·1	...	...	...	...	0·32	3	...

* And 14.

REMARKS, MARCH, 1885.

MALTA.—Mean temp. 57°·5; mean hourly velocity of wind 9·7 miles; sea temp. ell from 62° to 61°. J. SCOLES.

CAPE OF GOOD HOPE.—Max. temp. 1°·1 below average; min. temp. 0°·2 above average. W. ELLERTON FRY.

Mauritius.—Rainfall 1·51 in., mean temp. 0°·3, and mean hourly velocity of wind 1·5 mile below their respective averages; prevailing wind E.S.E., extremes of velocity 22·9 miles on 13th and 1·6 mile on 6th. T or L or both on 7 days.

C. MELDRUM, F.R.S.

Colombo.—TSS on 4 days and L on 2 other days.—F. C. H. CLARKE, Major R.A.

Melbourne.—Mean temp. of air 2°·3, and of dew point 2°·9; humidity 2, and pressure ·043 in. below the average; rainfall ·22 in., and amount of cloud ·3 above. Prevailing winds W. and S. strong on 5 days. L on 3 days, T on 1. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure, average; mean temp. (66°·0) 4°·8 below the average of 28 years and far the lowest during that period. The chief defect was in the max. readings, the mean being 6°·2 below the average; weather generally fine and pleasant. W. E. COOKE.

Wellington.—A wet month, especially in the early part, and frequently stormy. Mean temp. (60°·3) 2°·0 below average; R ·59 in. above average, L on 4 days. R. B. GORE.

Auckland.—Showery and variable in the early part of the month; violent hurricane from N.E. on 14th; thence to the close fine. Rainfall and pressure, average; mean temp. somewhat below it. T. F. CHEESEMAN.

JAMAICA.—The rainfall, over the whole island, was only one-third of the average, and the drought was severely felt over the greater part. MAXWELL HALL.

BARBADOS.—Mean temp. 73°·3, about the average. Prevailing wind N.E.; mean hourly velocity, 14·2 miles; extremes, 19·3 miles and 8·2 miles; rainfall, 9 per cent. below the average. R. BOWIE WALCOTT.

WATER STORAGE.

To the Editor of the Meteorological Magazine.

SIR,—If the advice (page 100) about storing rainfall was taken it would at once make an enormous difference in the possibility of keeping down insect attacks.

To give just one instance, I went down into Buckinghamshire lately to see about Leaf-roller caterpillar attack. There was an enormous old oak, which it was a special object to bring round, and they *had* water supply, so I suggested getting the fire engine, and the tree was drenched and brought round.

If there was water supply we could save thousands and millions of pounds that go through "Turnip Fly," Caterpillars, &c., &c.

Yours very truly,

ELEANOR A. ORMEROD.

Dunster Lodge, Spring Grove, Isleworth, August 7th, 1885.

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—The object of my letter on the above subject was to draw attention to the fact, which is indisputable, that the Atlantic *does* rise on the western shores for a considerable period before the approach of a storm, and to invite the attention of observers, favourably situated, to ascertain the data in connexion therewith.

I am now informed that the period extends to four and even six days under favourable circumstances, and if this can be maintained by observation, little more need be said to establish the importance of the phenomenon. Until then it is perhaps premature to attempt to theorize on the subject.

Yours, &c.,

G. WOULFE BRENAN, C.E.

Craigvarren, Oban, N.B.

WATERSPOUT OFF SHEERNESS.

To the Editor of the Meteorological Magazine.

SIR,—It may be of interest to some of your readers to know that a waterspout was observed just off the Nore Point, Sheerness, between 2 and 3 p.m. on the 20th ult. After the usual *modus operandi* of this phenomenon was complete, the spout was drawn up into the cloud, which took part in its formation. This cloud, thus heavily charged with water, then moved inland in a nearly due southerly direction, apparently to the range of hills which forms the backbone of Kent, discharging its contents as it proceeded. No damage is reported to have been done in its track; indeed, it was rather the reverse, as the pastures, &c., were much refreshed by the rainfall, which was greatly needed. A thunderstorm, with hail, and heavy passing showers, occurred later on in the afternoon.

R. MONTAGUE MERCER.

Rodmersham House, near Sittingbourne, September, 1885.

SUPPLEMENTARY TABLE OF RAINFALL,
 SEPTEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations,
 see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	5·48	XI.	Rhayader, Nantgwillt..	8·19
„	Margate, Birchington...	3·85	„	Carno, Tybrith ...	5·68
„	Littlehampton	4·56	„	Corwen, Rhug	5·22
„	Hailsham	4·89	„	Port Madoc	7·01
„	I. of W., St. Lawrence.	3·81	„	I. of Man, Douglas	6·00
„	Alton, Ashdell	5·92	XII.	Stoneykirk, Ardwell Ho.	4·37
III.	Winslow, Addington	4·51	„	Melrose, Abbey Gate ...	3·71
„	Oxford, Magdalen Col...	4·36	XIII.	N. Esk Res. [Penicuick]	5·10
„	Northampton	3·65	XIV.	Ayr, Cassillis House ...	...
„	Cambridge, Beech Ho...	2·93	„	Glasgow, Queen's Park.	5·01
„	Wisbech, Bank House...	3·65	XV.	Islay, Gruinart School..	7·66
IV.	Southend	...	XVI.	St. Andrews, Newton Bk.	4·55
„	Harlow, Sheering ...	3·71	„	Balquhiddier, Stronvar..	11·49
„	Rendlesham Hall	5·75	„	Dunkeld, Inver Braan..	5·56
„	Diss	5·49	„	Dalnaspidal H.R.S. ...	9·29
„	Swaffham	4·57	XVII.	Keith H.R.S.	3·46
V.	Salisbury, Alderbury...	4·99	„	Forres H.R.S.	3·07
„	Warminster	5·14	XVIII.	Strome Ferry H.R.S....	9·97
„	Calne, Compton Bassett	4·27	„	Lochbroom	6·81
„	Ashburton, Holne Vic..	7·79	„	Tain, Springfield	2·94
„	Holsworthy, Clawton...	6·90	„	Loch Shiel, Glenaladale	17·96
„	Hatherleigh, Winsford.	8·34	„	Invergarry	8·68
„	Lynmouth, Glenthorne.	5·81	XIX.	Lairg H.R.S.	8·33
„	Probus, Lamellyn	6·46	„	Forsinard H.R.S.	4·40
„	Wincanton, Stowell Rec.	6·06	„	Watten H.R.S.	3·97
„	Wells, Westbury	4·98	XX.	Dunmanway, Coolkelure	10·57
VI.	Bristol, Clifton	4·84	„	Fermoy, Gas Works ...	4·62
„	Ross	3·13	„	Tralee, Castlemorris ...	4·22
„	Wem, Sansaw Hall	3·06	„	Tipperary, Henry Street	3·14
„	Cheadle, The Heath Ho.	3·53	„	Newcastle West	5·25
„	Worcester, Diglis Lock	3·57	„	Miltown Malbay	6·82
„	Coventry, Coundon	2·83	„	Corofn	...
VII.	Melton, Coston	2·89	XXI.	Carlow, Browne's Hill..	5·20
„	Ketton Hall [Stamford]	3·01	„	Navan, Balrath	3·88
„	Horncastle, Bucknall ...	3·66	„	Mullingar, Belvedere...	5·45
„	Mansfield, St. John's St	2·98	„	Athlone, Twyford	7·20
VIII.	Macclesfield, The Park.	4·31	XXII.	Galway, Queen's Col...	5·51
„	Walton-on-the-Hill	4·64	„	Clifden, Kylemore	11·26
„	Lancaster, South Road.	4·36	„	Crossmolina, Enniscoe..	7·27
„	Broughton-in-Furness ..	...	„	Carrick-on-Shannon ...	4·70
IX.	Wakefield, Stanley Vic.	1·94	XXIII.	Dowra	...
„	Ripon, Mickley	2·80	„	Rockcorry	5·53
„	Scarborough	2·53	„	Warrenpoint	6·08
„	East Layton [Darlington]	...	„	Newtownards	3·77
„	Middleton, Mickleton ..	2·76	„	Belfast, New Barnsley..	5·97
X.	Haltwhistle, Unthank..	2·59	„	Cushendun	4·62
„	Shap, Copy Hill	6·77	„	Bushmills	5·77
XI.	Llanfrechfa Grange	6·59	„	Stewartstown	5·70
„	Llandovery	7·28	„	Buncrana	4·84
„	Castle Malgwyn	6·01			

SEPTEMBER, 1885.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which .01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1870-9	Greatest Fall in 24 hours.		Dpth.	Date.		Max.		Min.			
				inches.	in.				Deg.	Date.	Deg.	Date.		
													inches.	in.
I.	London (Camden Square) ...	4.30	+ 1.79	1.48	10	19	76.5	15	33.7	27	0	3		
II.	Maidstone (Hunton Court)...	3.67	+ 1.36	1.25	16	18	...	...	...	...	1	3		
III.	Strathfield Turgiss	4.26	+ 1.96	1.64	10	12	74.0	15	31.4	26	1	3		
III.	Hitchin	3.86	+ 1.38	1.56	10	22	68.0	15	31.0	26	2	...		
IV.	Banbury	3.50	+ .69	1.12	10	21	73.0	15	30.0	28	2	...		
IV.	Bury St. Edmunds (Culford)	4.27	+ 1.49	.91	10	21	75.0	15	28.0	26	2	...		
V.	Norwich (Cossey)	4.65	+ 1.57	.80	10	23	74.5	15	32.5	27	0	4		
V.	Weymouth (Langton Herring)	3.18	...	1.15	10	17	...	...	...	...	...	...		
"	Barnstaple	6.88	+ 2.60	2.15	10	20	73.0	7	38.0	26	0	...		
"	Bodmin	8.74	+ 3.50	3.02	10	23	65.0	4, 14	36.0	27	0	2		
VI.	Stroud (Upfield)	3.89	+ .64	1.28	10	18	72.0	17	30.0	27	1	...		
"	Church Stretton (Woolstaston)	4.08	+ .61	.60	10	25	68.0	15	35.0	26	0	...		
"	Tenbury (Orleton)	3.78	+ .43	.98	10	23	71.8	15	27.0	28	3	3		
VII.	Leicester	3.16	...	.88	10	18	76.0	15	31.6	28	1	7		
"	Boston	3.11	+ .50	.69	10	19	75.0	15	34.0	26	0	...		
"	Grimsby (Killingholme)	2.72	+ .35	.41	4	21	70.5	15	35.0	26	0	...		
"	Hesley Hall [Tickhill]	1.66	...	.28	8	18	77.0	15	31.0	26	1	...		
VIII.	Manchester (Ardwick)	4.46	+ .69	1.03	2	24	69.0	15	36.0	28	0	...		
IX.	Wetherby (Ribston Hall) ...	2.89	+ .19	.72	3	16	...	...	...	...	...	...		
"	Skipton (Arncliffe)	7.45	+ 1.87	1.04	2	26	68.0	1	31.0	27	2	...		
X.	North Shields	2.46	+ .14	.39	28	18	71.5	15	32.5	26	0	1		
"	Borrowdale (Seathwaite)	18.90	+ 5.68	2.45	12	26	63.9	6	32.0	27	1	...		
XI.	Cardiff (Ely)	6.25	+ 1.45	1.62	10	22	...	...	...	...	...	...		
"	Haverfordwest	8.84	+ 3.79	1.37	6	20	67.0	6	30.0	26	1	4		
"	Plinlimmon (Cwmsymlog) ...	8.39	...	.85	28	24	...	...	...	...	...	...		
"	Llandudno	2.96	+ .79	.75	30	19	66.8	4	40.2	26	0	...		
XII.	Cargen [Dumfries]	7.30	+ 2.89	.98	28	18	65.0	3, 7	30.2	27	1	...		
"	Jedburgh (Sunnyside)	2.13	+ .46	.34	26	17	65.0	6	30.0	1, 27	2	...		
XIV.	Douglas Castle (Newmains) ..	5.98	+ 1.58	1.06	11	20	...	...	...	...	...	...		
XV.	Lochgilthead (Kilmory)	10.97	+ 5.21	1.46	11	26	...	...	...	...	...	...		
"	Oban (Craigvarren)	10.19	...	1.31	20	26	64.3	7	34.0	27	0	...		
"	Mull (Quinish)	10.75	...	1.27	12	27	...	...	...	...	...	...		
XVI.	Loch Leven Sluices	4.90	+ 1.67	1.20	13	15	...	...	...	...	...	...		
"	Arbroath	3.52	+ .45	.73	8	15	64.0	6	35.0	27	0	...		
XVII.	Braemar	4.93	+ .99	.80	4	21	64.0	1	26.0	27	2	7		
"	Aberdeen	3.90	...	.83	20	22	65.0	19	32.0	26	1	...		
XVIII.	Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...		
"	Culloden	3.17	+ .27	...	...	...	65.4	4	32.0	1, 27	2	4		
XIX.	Dunrobin	4.51	...	.55	2	19	63.0	14	34.0	27	0	...		
"	Orkney (Sandwick)	3.78	+ .29	.64	2	21	60.5	7	36.7	1	0	1		
XX.	Cork (Blackrock)	6.30	+ 2.15	1.78	1	25	72.0	2	34.0	26	0	...		
"	Dromore Castle	7.61	...	1.45	18	23	66.0	10	35.0	26	0	...		
"	Waterford (Brook Lodge) ...	5.13	...	1.35	1	22	67.0	5	33.0	27	0	7		
"	Killaloe	5.46	...	.96	18	24	66.0	1	31.0	27	1	...		
XXI.	Portlargo	3.52	+ .34	.48	1	23	67.0	14	35.0	26	0	...		
"	Dublin (Fitz William Square)	2.86	+ .45	.36	2	23	68.9	12	34.4	27	0	3		
XXII.	Ballinasloe	5.30	+ 1.34	.92	18	23	65.0	2, 4	30.0	27a	3	...		
XXIII.	Waringstown	4.73	+ 1.38	.77	14	25	70.0	3	30.0	27	1	2		
"	Londonderry (Creggan Res.) ..	4.43	...	.63	28	26	...	...	...	...	...	...		
"	Omagh (Edenfel)	5.43	+ 1.39	.83	4	27	62.0	12	30.0	26	...	...		

α And 28.

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather, after the first week, was broken and unsettled, rendering the in-gathering of the harvest a slow and tedious business. The rainfall of the 11th was the heaviest in 24 hours ever recorded here in September. T on 25th. Ivy in bloom on 11th.

HITCHEN.—The coldest September for thirty years, and one of the wettest.

BANBURY.—Mean temp. ($52^{\circ}5$), 4° below the average. Harvest in the neighbourhood almost all secured in fair condition by the close of the month. Kidney beans and dahlias much injured by frost on the 28th. T and L on 7th; high wind on 10th and 15th.

CULFORD.—A very unsettled month, with T and L, and frequent heavy rains, and cold nights; on the 26th the frost cut down most of the bedding and other tender plants.

LANGTON HERRING.—Mean temp. nearly two degrees below the average of 13 years; the great cold from 25th to 28th inclusive was very remarkable, and S sleet and H fell at many places. Very stormy on 10th and 11th; heavy dew on 20th and 24th.

BODMIN.—A very cold September, with excessive rainfall, the fall on 10th far exceeded any other day's record during the 36 years that observations have been made. Mean temp. $56^{\circ}5$.

WOOLSTASTON.—A month of constant R, most disastrous for the later harvest.

ORLETON.—A very stormy changeable month, with rainfall much above the average. The nights were generally cold, and the days cloudy, and frosts occurred on 26th, 27th and 28th; the wind was frequently very rough, and the showery weather delayed the in-gathering of the corn crops. Mean temp. about two degrees below the average of 24 years; pressure unsteady, but the fluctuations not great; distant T on 4th.

KILLINGHOLME.—R fell frequently, but not continuously, retarding harvest, but the air being cool, the corn did not suffer as might have been expected. T and L on 3rd, 4th and 5th.

MANCHESTER.—The month was very unsettled, and there were few fine days; the rainfall was considerable in quantity, but more marked by its continuance; the weather was cold on several days, with two or three degrees of frost a short distance from the City; a little T, but of small consequence.

SEATHWAITE.—In seven hours on the 11th and 12th, 4.27 in. of R fell, causing a flood that did much damage; and on 10 days, one inch or upwards fell. First S on hills on 23rd. H, T, L, and heavy R on 30th; T on 5th.

WALES.

HAVERFORDWEST.—The wettest September since 1866, when the rainfall was 9.51 in. on 23 days. Fortunately it was never stormy, although fresh high wind prevailed in the dry intervals, neither was the air warm and close, or the consequences would have been most disastrous. Fully one half of the harvest was still in the fields at the close—a melancholy dashing of high hopes, no season of late years equalled it in quality of straw and grain. It was as wet, though not as stormy, as the disastrous September of 1871.

LLANDUDNO.—Mean temp. $2^{\circ}0$ below the average; monthly and diurnal range slightly less than the average. The first fourteen days were, although showery, fairly fine, the next 8 days were dry, bright, and very fine, and the remainder of the month was cold and showery; gale from S.W. on 11th, and very stormy on 24th and 25th, T and L on 24th; 127 hours of bright sunshine were recorded.

SCOTLAND.

CARGEN.—A very wet and stormy month; mean temp. $3^{\circ}2$ below the average, the coldest September since 1860, when the mean temp. was $51^{\circ}6$. The corn crops suffered very much from the excessive rainfall and gales of wind; T on 2nd, L on 13th.

JEDBURGH.—The month was marked by very low temp., a frost occurring on the 1st, which stopped the further growth of potatoes. Though there was a good deal of R, it was much needed for the root crops, and as the cold winds rapidly dried the corn in the fields, harvesting went on almost without intermission. In the higher districts much was still out at the close, but in good condition.

OBAN.—The rainfall was the most continuous in any month for some years, and the temperature was very low; the result being disastrous for the white crops which were far behind in quantity and quality. The rainfall on the 20th was constant and exceptionally heavy for seven hours; gales on 9 days, H on 24th.

QUINISH.—A very wet, cold, stormy month from first to last; very little corn secured in this district.

BRAEMAR.—A month of unsettled weather with occasional showers of S; very unfavourable for harvest work; crops short and much below the average.

ABERDEEN.—The weather was unsettled throughout the month, and the rainfall above the average. Auroræ seen on 12th and 15th; a beautiful lunar rainbow at 8 p.m. on 24th; vivid L on 3rd, H on 26th.

CULLODEN.—Harvest was retarded by the adverse weather, R falling in small quantities all through the month, with low temp. A very severe frost occurred on the morning of the 1st, injuring the potato crop.

DUNROBIN.—A wet month; bad harvest weather.

IRELAND.

DROMORE.—A wet and very cold month with some H showers; prevailing winds N.E. and N.W.; gales from S.W. towards the close.

WATERFORD.—A very wet and windy month; rainfall greatly above the average.

KILLALOE.—A very bad harvest month, with wind and R in excess; mean temp. $53^{\circ}3$; sharp frost on 27th.

DUBLIN.—The weather was very unsettled, rainy, and cool during the greater part of the month. H on 10th, 25th, and 30th, aurora on 4th, solar halos on 11th and 22nd, fog on 14th and 17th, L on 5 days; mean temp. ($53^{\circ}2$) $1^{\circ}9$ below the average; the month was decidedly cold, but not so cold as September 1866 (mean temp. $51^{\circ}9$), 1873 ($53^{\circ}0$), 1877 ($52^{\circ}4$), 1882 ($52^{\circ}0$). Mean humidity, 83; mean amount of cloud, 4.9; prevailing winds W., S.W., and N.W.

BALLINASLOE.—A very wet and stormy month, doing great injury to the harvest; L and T on 2nd.

EDENFEL.—A more complete or unwelcome reversal of all the characteristics of the preceding summer months could not have taken place; not one "harvest day" broke the monotony of the cold, tempestuous, and thoroughly inclement weather which prevailed throughout the month; nearly half the grain was still in the fields at the close, and much of it uncut. Several swallows, driven back apparently by stress of weather, were to be seen at the close, and some in their summer nests dead.